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28AUG98 E386310-1 D02589
P01/7700 25.00 - 9818678.6

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
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1. Your reference — P92659GB

2. Patent application number — 9818678.6
(The Patent Office will fill in this part)

28 AUG 1998

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Weighing Logistics Ltd
Blackthorne Road
Colnbrook
Slough, Berkshire, SL3 0AP

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

England and Wales

4. Title of the invention

Calibrating Weighing Installations

5. Name of your agent *(if you have one)*

Urquhart-Dykes & Lord (Reading)

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

1 Richfield Place
12 Richfield Avenue
Reading
RG1 8EQ

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1644027

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

Yes

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	6
Claim(s)	
Abstract	
Drawing(s)	2 + 2

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature Urquhart-Dykes & Lord Date 27 AUG 98

Urquhart-Dykes & Lord (Reading) - Agents

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr F P Wolff 0118 950 9937

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CALIBRATING WEIGHING INSTALLATIONS

This invention relates to calibrating weighing installations.

Installations such as weigh platforms or vessels (such as silos, tanks and hoppers) which are used in industrial processes for information and process control purposes usually have a working configuration of at least one working load cell, a support for a fixed side of the load cell, and a load mounted on a load-bearing side of the load cell. The load is usually transmitted to the working load cell through a vessel support bracket or other special bearing surface provided on the vessel, adapted to carry its weight and the weight of any contents. Typically, three or four working load cells, with corresponding supports and loads, are used in any one installation, so the aggregate load is the sum of all the separately measured loads. Some platforms and vessels use a mechanical arm system to transfer their weight to a single load cell. The term vessel will be used herein for convenience to include all receptacles, containers, platforms or the like for supporting whatever is to be weighed by a weighing installation.

Such installations need to be calibrated and re-calibrated from time to time, because of drift or creep in the electrical or mechanical properties of the load cells, or in the tare of the weigh platform or vessel. It is not usually practicable or good practice to remove the load cell or cells from the installation for re-calibration, because of the substantial impact this will make on the availability of the installation. In an industrial process, it normally would mean production downtime. Instead, the usual method adopted is to load the installation with standard dead weights of known value, or, in the case of tanks, with metred quantities of water whose weight can be calculated from the known volume and density.

However, although such methods are conventionally used, they still imply a substantial interruption in the normal operation of the weighing installation, which can be especially costly if it is normally in use in a continuous industrial process.

It is an object of the invention to provide an alternative system and method for calibrating weighing installations of the above kind, which enable calibration to be carried out quickly and accurately.

The present invention concerns aspects of the system for calibrating weighing installations described below. The scope of the invention extends to all novel aspects of the system, including methods of putting it into effect, whether individually or in combination with any of the other features disclosed herein.

More specifically, in one aspect of the invention, a system for calibrating weighing installations of the aforementioned kind comprises portable apparatus movable between installations to be calibrated, and fixed apparatus at each installation to be calibrated, wherein the portable apparatus includes a reference load cell and a fluid ram, the fixed apparatus includes anchorage means fast with the working load cell support, and the reference cell and the ram are removably connectable between the anchorage means and the load-bearing side of the working load cell to apply calibrating loads to the working load cell in its working configuration.

The fixed elements of the calibration system need be no more than the anchorage means only, at each working load cell support. The working load cells, which generally tend to be shear beams of one design or other, normally rest on load plates. The anchorage means can with advantage be incorporated into each load plate. Alternatively, the anchorage means can be provided on the solid base to which the load plates themselves are fastened.

The anchorage means are desirably close to the working load cells. It is in practice unlikely that the calibrating loads will be applied directly to the working

load cell, because its load-bearing side is already carrying the weigh vessel. The calibrating load is accordingly applied to the weigh vessel itself, and it is generally convenient to apply those loads to the parts of the structure that are designed to take and transmit loads, which will normally be adjacent the point at which the weigh vessel is mounted on the working load cell, for example at an existing mounting bracket.

The portable elements in the system include the fluid ram, normally a hydraulic ram, and the reference load cell, and may also include supplementary fixings, for example a cradle to fasten to the anchorage means and hold the ram and reference cell in a proper position to exert calibrating loads on to the working load cell. Preferably, position adjustment means are included in the portable elements, to permit the reference cell to be properly positioned in relation to the working cell in different weighing installations, in which the anchorage means may not be identically positioned in relation to the working cells.

The reference cell should be accurate and may be periodically standardised by secondary referents traceable to an appropriate ultimate standard.

One embodiment of the invention is illustrated, by way of example only, in the accompanying drawings, in which:

Figure 1 is a front elevation of a system in accordance with the invention, with a cross beam shown in section, and

Figure 2 is a side elevation of the system, one face of a weigh vessel support bracket having been cut away for clarity.

The drawings show the system of the invention as applied at one weighing station of a permanent weighing installation for measuring loads carried by a vessel 10, provided with, typically, three or four such weighing stations. At each weighing station the vessel is supported by a rigid bracket 12, which rests on a

cantilever shear beam working load cell 14. This in turn is mounted on a load plate 16, bolted to a concrete beam 18 which is part of the permanent structure carrying the weigh vessel.

In accordance with the invention, anchorage means are provided which are fast with the working load cell support. The anchorage means comprise two pairs of parallel upstanding steel webs 22 welded to the load plate 16 on either side of the load cell 14. The webs are pierced with slots 24.

The pierced webs provide an anchorage that is fast with the working load cell support. Similar anchorages are provided in association with each working load cell, so that the portable apparatus, described below, can be used to calibrate each working load cell in turn.

The principal elements of the portable apparatus are a reference load cell 30, and a hydraulic ram 32. The ram presses the reference load cell downwardly against bracket 12 supported on working load cell 14. In order to do this, a cradle 34 is provided. The cradle includes typically two tie bars 36 joined by a cross beam 38. For greater loading capability, additional tie bars may be used, eg four in total. Each tie bar extends upwardly from a base 40 which is retained between a respective one of the pairs of anchorage webs 22 by means of bolts or pins 42 in the slots 24. The upper ends of tie bars 36 are retained in slots 44 in the cross beam. A vertical hole 46 through the centre of the cross beam provides an attachment point for ram 32. By virtue of the slots 24 and 44, which extend at right angles to one another, the horizontal position of the ram can be adjusted until it is exactly over the load bearing region of load cell 14.

A spherical male/female self-levelling washer combination 48 is located between the reference load cell 30 and the upper surface of bracket 12 against which it will bear, to accommodate any small misalignment between the portable apparatus and the surface of the bracket. It may be beneficial to incorporate a level bubble in cross beam 38, to assist in setting up the portable apparatus with

ram 32 vertical.

The reference load cell 30 is suitably a pancake load cell, in which a central core, over combination washer 48, is supported by shear webs from an outer rim, which is acted upon by ram 32.

An adjusting screw 50 is provided to give fine adjustment to the vertical position of reference load cell 30. Desirably, the screw is used to back the reference cell off from bracket 12 in order to prove the zero load, with the vessel empty.

It can thus be seen that the loadings applied to working load cells 14 by hydraulic ram 32, held down by tie bars 36 anchored to load plate 16, can be accurately measured by reference cell 30 and used to calibrate working cell 14.

As illustrated, the cradle 34 is part of the portable apparatus. However, if fixed in position at each working load cell location, a corresponding cradle could be provided as part of the fixed apparatus, for example if the portable apparatus were required to be used in a variety of locations in which a single cradle design would not be sufficiently adaptable. Furthermore, in some weigh vessel designs, the bracket 12 could be configured in relation to the fixed vessel support structure that the ram and reference cell could act between the anchorage means and the working cell without the need for any intermediate connecting member such as the cradle. In effect, the cradle itself then provides the anchorage means fast with the working load cell support. The relative positions of the reference load cell and the ram can of course be varied to adapt to the physical space available.

By providing a portable ram and reference cell, and pre-installed anchorage points at each working load cell location, weighing installations can be calibrated quickly and economically with minimal interference and disturbance to production weighing installations.

In a modification of the invention, irrespective of the presence of any working load cell, the portable apparatus of the system can be used to apply lifting force between anchorage means and a vessel in order to act as portable weighing apparatus, for intermittent or periodic weighing operations.

By applying a load through a reference cell directly to the working load cell or cells or vessel, it is not necessary to utilise pulleys, bearings or levers that introduce mechanical errors into the accuracy of the calibration, and the calibration apparatus can be made portable, as described, between vessels of different sizes and designs.

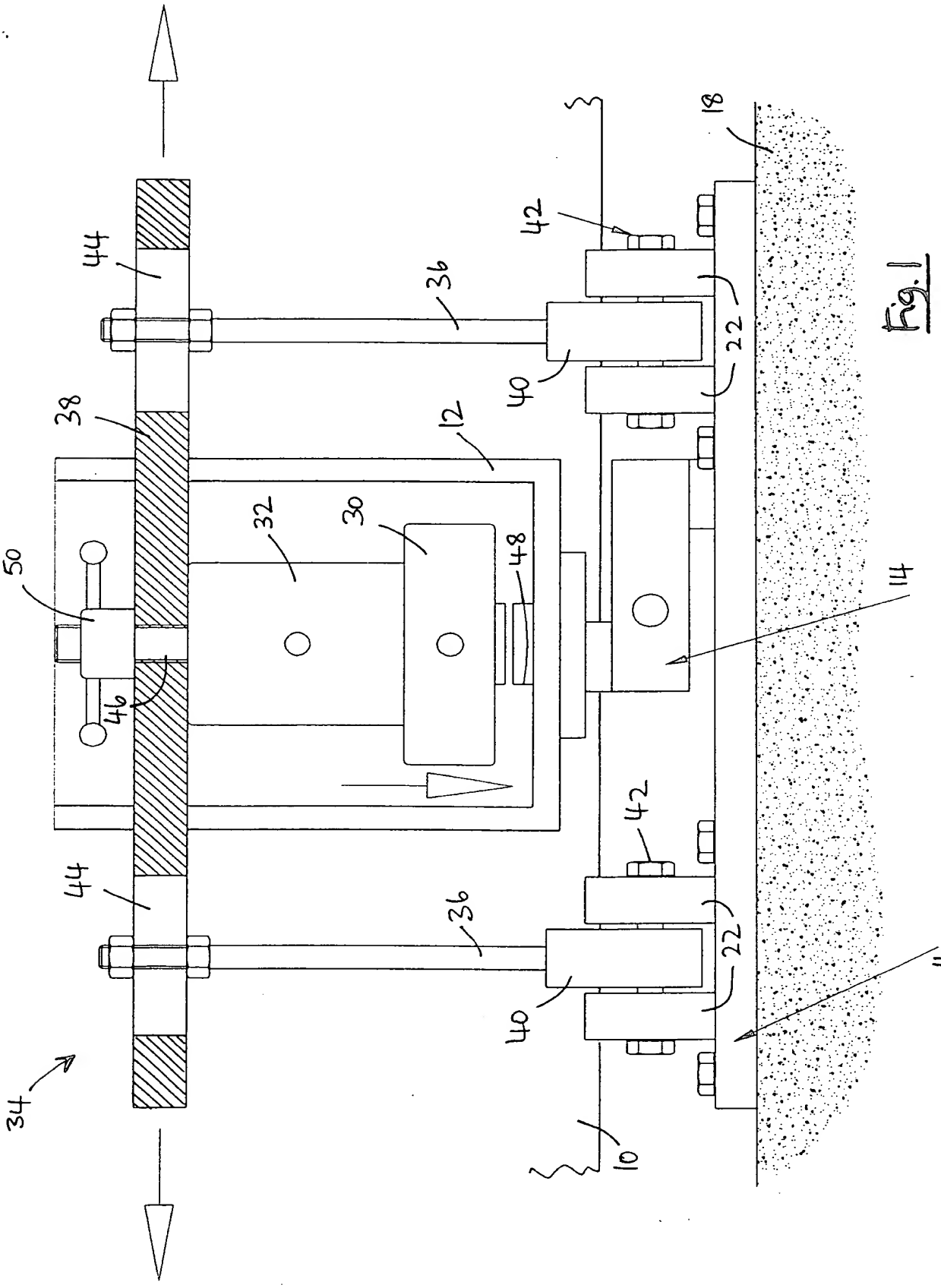

Fig. 1

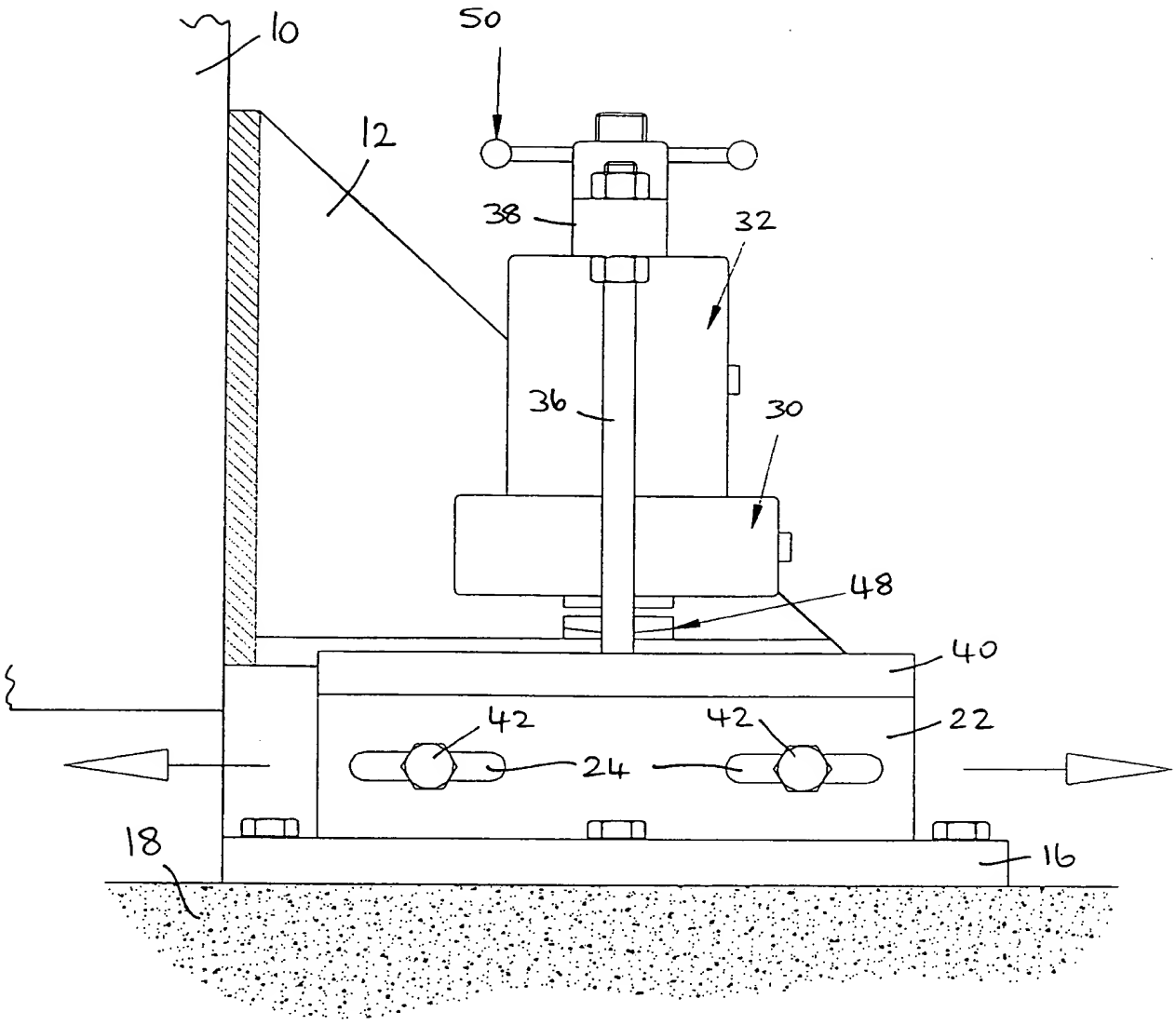

Fig. 2